

REMARKS

The present invention is a method of active seismic monitoring of an underground formation, as recited in claim 11, providing separation of induced microseismicity signals from seismic signals emitted during active seismic monitoring of an underground zone development, the induced microseismicity signal and the seismic signals being obtained during the active seismic monitoring and a method of active seismic monitoring of an underground formation, including discrimination of induced microseismicity signals from among signals emitted within a context of active seismic monitoring of an underground zone under development, the induced microseismicity signals and the seismic signals being obtained during the active seismic monitoring as recited in claim 17. A method in accordance with the invention comprises carrying out seismic recording cycles with emission of seismic waves in the formation by coupling therewith at least one seismic source which, emits, simultaneously orthogonal signals so as to form a composite vibrational signal, receiving signals reflected by the formation in response to the emission of seismic waves, recording the signals received by at least one seismic pickup and processing the recorded signals to separate respective contributions of each seismic source to the received signals and to reconstruct seismograms equivalent to seismograms that would be obtained by separately actuating each seismic source, separating the induced seismic signals in the records from seismic signals resulting from active monitoring operations, by isolating a contribution thereof by comparison with a reference spectral model, the reference spectral model accounting for spectral contributions of each seismic source at emitted fundamental frequencies and at

respective harmonics thereof, and by reconstructing the microseismicity signals by inversion in the time domain.

Claim 11 stands object to for various informalities noted by the Examiner. Claim 11 has been amended to correct those informalities. The Examiner is thanked for pointing those out on the record.

Claims 11-20 stand rejected under 35 U.S.C. §103 as being unpatentable over United States Patent 6,442,489 (Gendelman) in view of United States Patent 5,721,710 (Sallas). These grounds of rejection are traversed for the following reasons.

Claims 11 and 17 have been amended to recite in the preamble "the induced microseismicity signals and the seismic signals being obtained during the active seismic monitoring". The Examiner stated, in the "Response to Arguments", at the top of page 3 of the Office Action that

"[t]he claim language states 'separation of induced microseismic signals from seismic signals emitted within in a context of active seismic monitorings'. Interpreting this limitation broadly, the microseismic signals to [sic] not need to be recorded during the active survey. The microseismic signals only need to be separated from seismic signals where the seismic signals are taken as part of or related to an active seismic survey. The claim language does not state that both the microseismic and the seismic signals must be obtained during an active seismic survey" (emphasis added).

As noted above, the claims now recite that the induced microseismic signal and the seismic signals are obtained during the active seismic monitoring which renders moot the Examiner's broad construction of the independent claims. Moreover, the citation of Sallas does not cure the deficiencies of Gendelman which are reflected in the amendment of claims 11 and 17

pertaining to induced seismic signals and the seismic signals being obtained during active seismic monitoring.

Moreover, claims 11 and 17 recite separation of "the induced microseismic signals in the records from seismic signals resulting from active monitoring operations, by isolating a contribution thereof by comparison with a reference spectral model." In this regard it is noted that the Examiner has cited the Abstract; column 2, lines 1-30; column 3; column 4, lines 14 to column 5, line 5; and column 5, line 37 to column 6, line 33 with reference to Figs. 3 and 8. However, it is submitted that Gendelman does not teach separation by isolating the contribution thereof by comparison with a reference spectral model accounting for spectral contributions of each seismic source at emitted fundamental frequencies and at respective harmonics thereof. While the Examiner suggests that such subject matter is disclosed in the cited portions, it is requested that the Examiner specifically point out on the record how the foregoing limitations are met by the cited portions in response to this amendment if the Examiner persists in the stated grounds of rejection.

Moreover, it is further submitted that Gendelman does not teach a "reference spectral model" as recited in the foregoing claim language involving a comparison with the reference spectral model. It is requested that the Examiner specifically point out on the record where the reference spectral model is in the referenced portions of Gendelman's disclosure if the Examiner persists in the stated grounds of rejection.

The Examiner has additionally stated that Sallas discloses the emission of orthogonal signals with the Examiner citing column 4, line 35 to column 5, line 15 and column 12. However, it is submitted that the referenced portions of Sallas do not disclose orthogonal signals. Therefore, if the Examiner persists in the stated grounds of rejection, it is requested that he comment on the record where Sallas discloses orthogonal signals.

Moreover, it is submitted that the Examiner's suggested combination of Gendelman and Sallas is based upon impermissible hindsight. If the proposed combination were made, the subject matter of the invention would not be obtained since the deficiencies of Gendelman, as noted above, are not cured for by Sallas. Sallas, as pointed out above which has been cited for the emitting of orthogonal signals, does not provide the deficiencies of Gendelman, and has been erroneously cited as disclosing the emission of orthogonal signals. Therefore, if the teachings of Gendelman and Sallas were combined, the subject matter of the claims would not be achieved.

In view of the foregoing amendments and remarks, it is submitted that each of the claims in the application is in condition for allowance. Accordingly, early allowance thereof is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the

filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (612.44921X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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Attachments

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